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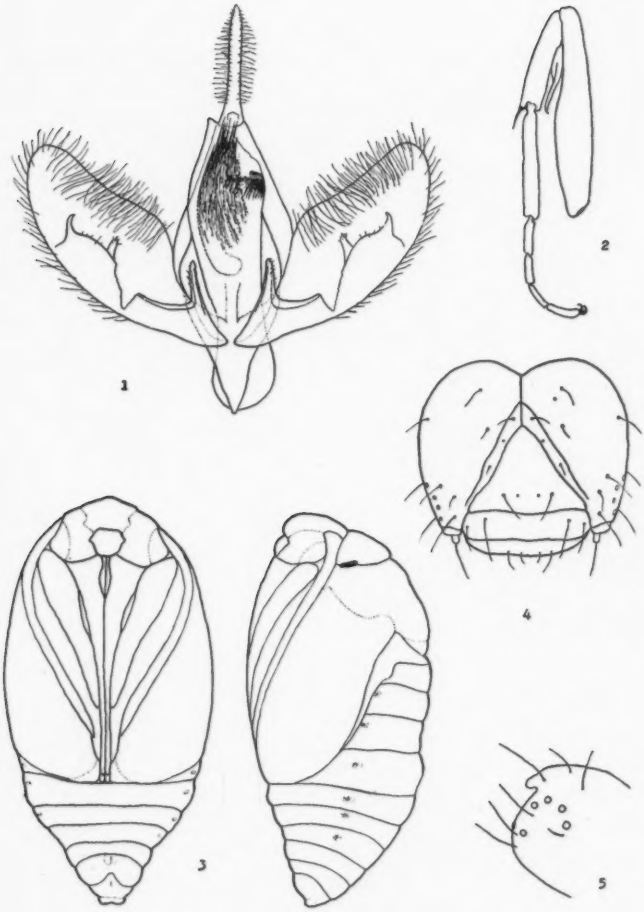
CIRRHOPHANUS TRIANGULIFER—JONES.



CIRRHOPHANUS TRIANGULIFER—JONES.

ENTOMOLOGICAL NEWS

VOL. XLVIII. MAY, 1937 No. 5

Cirrhophanus triangulifer Grt. (Lepidoptera, Noctuidae) in Delaware.

By FRANK MORTON JONES, Wilmington, Delaware

(Plates II and III)

Cirrhophanus triangulifer was superficially described by Grote in 1872 as the type of a new genus, from a specimen "shown me in St. Louis by a gentleman whose name and address I have recently unfortunately forgotten." In 1883, C. V. Riley, the aggrieved owner whose name was "unforunately forgotten," published a figure of the venation of *triangulifer,* described its leg structure, its peculiar frontal protuberance, and the exsertile ovipositor of the female; and believing that "structure is a very safe guide to habit," concluded that its larva must be an endophyte—an inference indeed suggested by some of these characters, but not borne out by later knowledge of its habits. Though having an extensive geographical range, and though conspicuously beautiful among our eastern *Noctuids,* in the sixty-five years since its first description this insect has accumulated few references in our literature, none of which refer to its early stages.

In Delaware, my acquaintance with this insect began on September 3, 1911, when I found a moth sitting by day in the flower-head of *Bidens involucrata,* the golden yellow-brown of its wings matching closely the color of the flower. No further observations were made for six years, when on August 28, 1917, I found two more of these moths, each sitting quietly in a flower of this same species. Among these three, all flown examples, both sexes of the insect were represented. Their lethargic daytime presence in the flowers did not seem to be a feeding habit, yet by three successive observations it seemed assured that these flowers, matching so closely their own colors, must be a habitual daytime resting-place of the moths. This suggested the further possibility that the flower-heads or the

ripening seeds might prove to be the larval food of the species.

Rather casual search was made from time to time, but it was not until mid-September, 1933, that I found a few small golden-yellow *Noctuid* larvae feeding in and on the flower-heads of *Bidens involucrata*. These larvae, too, matched the flower-heads closely in color, so most of them were found by looking for mutilated flowers from which the larvae had eaten some of the conspicuous yellow rays. That year, however, I did not succeed in carrying any of these larvae to the pupal stage; and the next year, though more larvae were found feeding in the flowers, the whole colony was so pervaded with a fungoid disease that only a single earthen cocoon was secured, and from this nothing emerged.

In September, 1935, more larvae were collected from widely scattered stations for the plant, from these larvae eight earthen cocoons were secured, from which there emerged (August, 1936) three large *Hymenopterous* parasites of as many species, two *Tachinid* flies, and on August 22, a flawless female of *triangulifer*, confirming the conjectured identity.

As stated, the small flower-inhabiting larvae, when first found, were yellow, closely matching the colors of the composite flower. Two larval stages succeeded this, in which increasing size inhibited the occupancy of a flower-head, and in these later stages the larva is usually to be found stretched longitudinally along the plant-stem beneath the flower (Plate II). Its resting attitude is characteristic: the head is retracted, the slightly swollen anterior segments are arched, and its sphinxlike attitude is enhanced by a rather prominent and acute dorsal hump on the eleventh segment. These later larval stages show wide individual differences in color-tone, ranging from greenish-yellow through olive to a more prevalent form of deep velvety brown. The intricate color-pattern varies in intensity as well as in tone, but remains otherwise identical throughout these phases.

The last-stage larva has a length (extended) of about 30-35 mm., a greatest breadth of about 5 mm., and a head-width of 3.1 mm. The head (Plate III, fig. 4, front view; fig. 5, eye arrangement) is smooth, moderately polished, and marbled with

darker flecks which become concentrated into a dark vertical band on the face of each epicranium, apically broad and diffuse, narrow and more dense below and bordered laterally with a paler clear area. The pattern of the thoracic and abdominal segments is intricate, its more evident features being as follows: a narrow dorso-median band bordered on either side with a narrower dark line, all more distinct on the thoracic segments except as partially obscured on T1 by mottlings which mark the position of a cervical shield, which, however, is not present as a chitinized plate; on the thoracic segments a strongly-contrasting pale line, which passes just below the spiracle of T1, and which on the abdominal segments is continued as a series of interrupted oblique dashes, on A1 encircling the spiracle, on succeeding segments forked below the spiracle and sending a strong ray down the outside of each abdominal proleg. The most conspicuous markings of all are a series of oblique segmental spots, broadly tear-shaped, the backward-directed point of each spot originating close to the dorso-medial lines, thence expanding widely, forward and downward, and becoming more diffuse as it reaches the level of the spiracles. These spots are much more strongly marked on segments T2, T3, A1, A2, rendering these four segments conspicuously darker than those following. The spiracles are yellowish-brown with narrow black margins, and the setigerous tubercles are inconspicuous.

Pupation takes place in the ground. The earthen cell (Plate II) is not composed of earth loosely compacted by the movements of the larva, nor of earth-fragments held together with silken threads, but is firm, compact, and thin-walled throughout, as though cemented. Rounded at the ends, it is from 16 to 19 mm. in length, 8 to 11 mm. wide, and its walls, exclusive of the earth-fragments which roughen its exterior, are usually less than one millimeter in thickness. In spite of this apparent fragility of construction, the cell is almost nutlike in its resistance to breakage. The interior is smooth, apparently unlined, and the contained pupa almost fills the cavity and to some degree seems moulded to its shape.

Only a single living example of the pupa was available for study. Its form is shown, Plate III, fig. 3. Length, 14 mm.; width, 7 mm. The cuticle is thin and delicate, dull ochraceous orange in color, with the dorso-caudal edges of the abdominal segments darker. The front is elevated but not acutely pro-

duced. The labial palpi are visible, the prothoracic femora narrowly so. The cremaster is low, broad, rounded, and destitute of spines of setae. The mesothoracic spiracle is conspicuous as a narrow pillow-shaped protrusion, strangely changing from black to shining white with changes in the angle of reflected light. Pupation occurs in late September or early October; emergence of the adult, the following August.

With this knowledge of the larval habits of *triangulifer* and of its earthen cocoon, it is apparent that if Riley correctly interpreted the function of the peculiar frontal protuberance of the moth as an aid in emergence from a confined space, then that structure relates—not to escape from a tunnel in root or stem, but to exit from the tough-walled cocoon. This character, therefore, does not justify an association of *triangulifer* with *Nonagria;* and though at various times a relationship with *Nonagria,* with *Heliothis,* even with *Plusia,* has been suggested, it departs from all of these in venation, in leg-structure (Plate III, fig. 2, showing single-spined fore tibia), and in the male genitalia (Plate III, fig. 1). Neither is it, in these characters, close to *Cosmia orina* Gn., which precedes it on our list, but in all of them it closely resembles *Basilodes* (compared with *chrysopis* Grt.) which follows it, and with which its real relationship seems to lie.

Bidens involucrata, with which I have found *triangulifer* in these observations scattered over a quarter of a century, is not a native of Delaware, though now in late summer its flowers transform our tidal marshes into a sheet of gold. While this plant made its appearance here about the year 1900 as an invader from the southwest, there are in Delaware ten similar (and truly native) representatives of the genus. Nor is this plant genus the insect's sole foodplant, for I am informed by Mr. Geo. P. Engelhardt that years ago he bred *triangulifer* in considerable numbers from larvae collected near Washington, D. C., on a tall yellow-flowered wing-stemmed Composite (probably *Verbesina*). Though thus not confined even to a single plant genus, the observed correspondence between larval and foodplant colors, between the moth and its day-time resting-place, suggest a relation analogous to that existing between *Rhodophora florida* and *Oenothera,* with similar significance.

A Slave-making Leptothorax. (Hymen.: Formicidae)[1].

By LAURENCE G. WESSON, JR., Haverford College.

A single colony of an interesting new species of *Leptothorax* was taken in a large oak gall near Jackson, Ohio, near the end of July, 1935.

Leptothorax (Mychothorax) duloticus sp. n.

Worker: (Fig. 1), length 2.4-2.6 mm. Head longer than broad, somewhat narrower in front than behind; the posterior

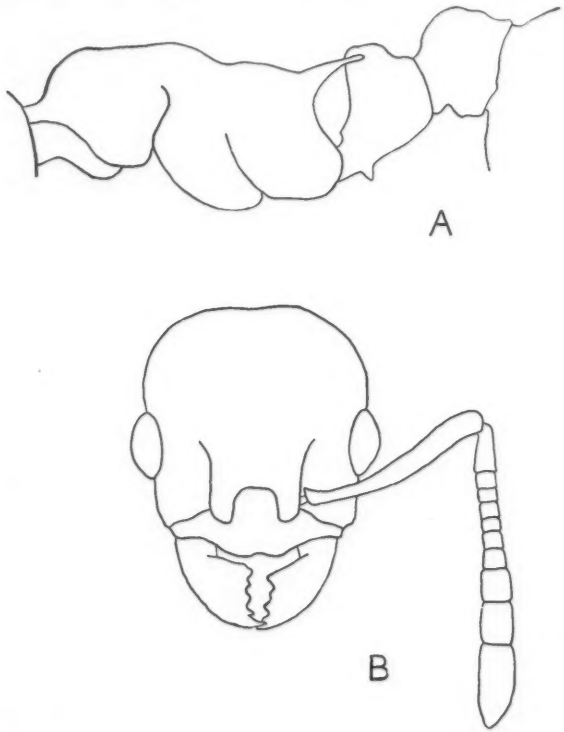


Fig. 1. *Leptothorax duloticus* sp. n. A. thorax of worker in profile. B. head of same from the front.

[1] Contribution No. 19 from the Dept. of Biology of Haverford College.

corners broadly rounded, the posterior border faintly excised. Mandibles 5-toothed, robust; teeth coarse, short and blunt. Clypeus convex, not impressed in the middle; the anterior border narrowly and rather shallowly notched in the middle, the sides sinuate. Antennae 11-jointed; scape extending to the posterior border of the head; first funicular joint as long as the succeeding joints; joints 2-7 slightly broader than long; remaining 3 joints forming a distinct club which is nearly as long as the remainder of the funiculus. Eyes broadly oval, large, the longest diameter equal to 1/4 the length from base of mandibles to posterior corner of head.

Thorax moderately robust, the humeral angles rounded. Mesoëpinotal constriction broad and shallow. Promesonotal suture distinct. Epinotal spines long, thick, blunt, divergent, somewhat recurved; length about 1 1/3 times the distance apart at their bases and about as long as the epinotal declivity. Petiole viewed from above with sides straight and subparallel; about 1¼ times longer than broad. Node high; in profile, the anterior slope is slightly concave; the posterior slope shorter, strongly convex, subangulate; seen from the rear the node is compressed, the summit somewhat concave with angular corners. Ventral tooth prominent, directed downward. Postpetiole seen from above slightly greater than 1½ times the width of the petiole; in profile the dorsal surface is convex and evenly rounded; the anterior angles prominent but obtuse. Gaster and legs of the usual shape for *Mychothorax*.

Head, thorax, petiole and postpetiole very densely and coarsely punctate; in addition the head bears faint irregular rugae on the front and vertex, coarser and subparallel rugae on the cheeks and around the antennal insertions; top of thorax bearing faint irregular rugae. Mandibles feebly shining, with sparse, irregular, longitudinal striations. Clypeus rather shining, with several longitudinal rugae. Epinotal declivity, gaster and legs smooth and shining.

Body bearing sparse, long, erect, obtuse hairs on vertex of head, thorax, petiole and postpetiole; less obtuse and more numerous on the gaster. Antennae, legs and gaster bearing acute, fine reclinate hairs, rather dense on the antennae, less numerous on the gaster and legs.

Color light brown; funiculi and a band across the middle of the gaster darker.

Female: length 3.25 mm. Anterior margin of clypeus shallowly but distinctly emarginate. Antennal scape reaching to midway between the eye and the posterior corner of the head.

Eyes and ocelli large. Thorax stout, of the usual female shape; showing distinct traces of having borne wings. Epinotal spines shorter and stouter than in the worker; length about 2/3 the distance apart at the bases. Petiolar node as seen from behind lower and more rounded than in the worker.

Head, petiole and postpetiole rather densely punctate, the punctures wide and shallow giving a subreticulate appearance; faintly shining and distinctly rugose. Clypeus shining, with 8-10 longitudinal rugae. Mesonotum and scutellum feebly shining, with fine sparse longitudinal rugae. Pleurae shining, finely and sparsely punctate. Pronotum and epinotum finely, irregularly and rather closely reticulate-rugose, the rugae with a longitudinal trend. Gaster and legs smooth and shining. Integument covered with scattered fine appressed hairs which are more numerous on the antennae; front and vertex of head, thorax, petiole, postpetiole and gaster with additional long erect slender pointed yellow hairs.

Color light brown with a darker band across the middle of the gaster; antennal insertions and a ring around each ocellus, black.

The 11-jointed antennae, marked mesoëpinotal constriction and the general shape of the petiole definitely place *L. duloticus* in *Mychothorax*. Apparently close to *L.* (*M*) *hirticornis*, it is easily separated from that species by the well-defined notch in the anterior border of the clypeus, the long rather thickened spines, the long erect obtuse hairs, and the normal character of the female thorax. Other salient characters of the species are the large eyes, the coarsely and densely punctured integument and the long antennal scapes.

Described from a female and 4 workers which are deposited in the author's collection.

This colony, when opened, was found to contain, in addition to 5 *L. duloticus*, 11 workers of *L. curvispinosus* and 12 workers of *L. longispinosus*. Both of these latter species were abundant in the locality. The mixed colony arose either by the adoption of a *duloticus* female into a mixed *curvispinosus-longispinosus* colony, or through slave raids by *duloticus* workers on one or both of these species. That the former method is highly improbable is indicated by the very infrequent discovery of mixed *curvispinosus-longispinosus* and of *duloticus*

colonies. That *duloticus* is indeed a slavemaking species is borne out by the following observations.

The *duloticus* colony, together with its accompanying *curvispinosus* and *longispinosus* workers was transferred to an artificial nest, and a colony of *curvispinosus* in a twig, broken open to expose the brood, was placed about 3 inches away. The temperature was quite warm. The *duloticus* were very active, spending a considerable portion of their time running agitatedly around the nest. In about 20 minutes a worker *duloticus* found the *curvispinosus* nest and began to examine it. She was soon seized by a *curvispinosus* worker, but after they had fought for a few minutes they separated. The *duloticus* worker continued her exploration for a few minutes until she found an unguarded pupa, which she picked up and carried back to the home colony. The arrival of the pŭpa caused a little excitement in the *duloticus* nest. About 5 minutes later she returned to the *curvispinosus* colony followed by a second *duloticus* and two *curvispinosus* workers. The latter soon grappled with workers from the introduced colony while the two *duloticus* each picked up a pupa and returned to their nest with them. Meanwhile a third *duloticus* found the colony, picked up a pupa and returned to her nest with it. These three *duloticus* continued to return at irregular intervals and carry off the *curvispinosus* brood until they had taken all but some eggs and young larvae which were being carried about by the *curvispinosus* workers of the raided nest. The *curvispinosus* submitted almost without resistance, in the main quietly allowing the *duloticus* to walk among them. Occasionally one offered resistance but the combats never lasted more than a few minutes, ending either with the flight or injury of the *curvispinosus*. The whole procedure was slow and unsteady, requiring nearly 2½ hours to carry off some 14 pupae and larvae, and would undoubtedly have taken considerably more time had the *curvispinosus* resisted very much. Probably this passivity was due to demoralization of the colony when it was opened.

In the artificial nest the *duloticus* were often observed to drink honey and occasionally to tend the brood: observations

which would indicate that these ants are not wholly dependent on their slaves for support. When moving from one nesting site to another, the *duloticus* were carried by the *curvispinosus* and *longispinosus* workers.

These observations immediately suggested a comparison between *L. duloticus* and *Harpagoxenus*. *Harpagoxenus* is the only other genus known to enslave species of *Leptothorax;* and it is closely related to the subgenus *Mychothorax* of *Leptothorax*, from which it probably arose.[2] *Harpagoxenus* includes only two species, one in Europe and one in the eastern United States. Both species are advanced obligatory slavemakers, and both display many highly specialized morphological characteristics. Of the origin and development of the highly specialized behavior of *Harpagoxenus*, there has been no inkling. It is this gap between *Harpagoxenus* and the independent species of *Mychothorax* which *L. duloticus* with its primitive slavemaking behavior as indicated by the disorganized character of its slave raids, the apparent absence of specialized structural characteristics and the survival, in attenuated form perhaps, of most of the instincts of independent *Formicidae*, can fill; taking a position between them which is analogous to the position of *Formica sanguinea* between *Polyergus* and *Formica fusca*. There is no apparent indication that *L. duloticus* is on the direct line of descent of *Harpagoxenus*, or even that the two forms arose from an immediate common ancestor. It is quite possible that *L. duloticus* is a distinct branch of *Mychothorax*, a group which shows a very strong general tendency toward symbiotic habits. Discovery of the male of *duloticus* will probably shed considerable light on the phylogenetic relationships of that species. But whether *Harpagoxenus* and *L. duloticus* had a common ancestor, or whether they arose independently, there can be little doubt that *L. duloticus* is probably very close to an hypothetical early stage in the evolution of the form of slavemaking behavior whose highest development is displayed by *Harpagoxenus*.

[2] Creighton, *Harpagoxenus americanus* slave raids pp. 11-26 Psyche *34*, 1927.

Fabricius as the First Designator and Original Inventor of Genotypes.

By RENÉ MALAISE, Swedish Museum of Natural History, Stockholm 50.

In the ENTOMOLOGICAL NEWS, Vol. XLVII, Nr. 8, page 214, October 1936, the Acting Secretary of International Commission on Zoological Nomenclature, Mr. C. W. Stiles, gave "Notice of possible Suspension of Rules of Nomenclature in Certain Cases."

Firstly, the so-called "Erlanger List" of 1801 is proposed to be suppressed. This suppression is well founded because:

1) This list was published in a non-scientific journal, although the author of the list, viz. Panzer, could very well have published it in such a journal as he himself was the publisher of one.

2) The enumeration of species is clearly meant as examples, which is proved by the naming, in some cases of several species, in others of none, as belonging to the different genera. According to the rules, examples cannot be interpreted as selection of types; compare Science, n. s. Vol. 26, Nr. 668, p. 521, Oct. 18, 1907, "the meaning of the expression 'select type' is to be rigidly construed; mention of a species as an illustration or example of a genus does not constitute a selection of a type." For that same reason the "Example" of species enumerated after each genus in the works of Latreille earlier than 1810 cannot be accepted as a type-selection. Even in this work of 1810, "Table des genres avec l'indication de l'espèce qui leur sert de type," it is more than questionable whether Latreille really had the intention of designating genotypes in the same sense as we have it to-day, because in later works, when monographing whole genera of *Lepidoptera*, he never selects any types. This work of his of 1810 has been definitely accepted as designation of types and may well remain as such, but Latreille was not the first to designate types, because Fabricius had already done so several years before Latreille and in the

modern sense. In all the later works of Fabricius, *e.g.*, "Systema Piezatorum" of 1804, and also in some earlier ones, although not so frequently, he designates one species and never more than one in every genus, with the exception of some genera already known and not erected by himself. As already pointed out by Roman (Entomologisk Tidskrift, 1933, p. 37) and others before him, Fabricius is to be considered as the inventor of genotypes in the modern sense. Not to recognize him as the first designator of genotypes because he did not use the very name "type," but preferred to mark his types through a special and very elaborate description of the mouthparts, would be as ridiculous as to try to deprive Columbus of the fame of discovering America because he did not name it so.

To show that this designation was recognized of old the following is quoted from:

1) Curtis (British Entomology, Vol. III, Hymen. Part I, pl. et. fol. 736, April, 1839) "1st Bassus of Fabricius is Gravenhorst's 3rd family Cryptus, *seductorius* being the type given in the Piezatorum; 2ndry....." This citation was quoted literally, although with some minor changes in the spelling, by Morley (Revision of Ichnemonidae, Part II, p. 62, 1913).

2) Bergroth (Entom. Nachrichten, XX, p. 197, 1894) "Auch Fabricius war der Typus-begriff ganz klar. Namentlich hat er in seinen späteren Schriften, theilweise schon in der Ent. Syst., in seinen Gattungen je eine Art als Typus dadurch ausdrücklich bezeichnet, dass er dieselbe ausführlicher, unter hinzufügung auch oder nur generischer Detailcharaktere, wie sie bei den übrigen Arten nicht angegeben werden, in einigen Arbeiten sogar mit besonderen Lettern beschrieben hat. . . . Mit Recht bezeichnet Reuter in seiner "Revisio Synonymica Hemipterorum" Fabricius als den Ersten, der Wirkliche Gattungstypen aufgestellt und so fasste schon früher Stål die Sache."

In the following list the genotypes are enumerated as desig-

nated and named by Fabricius in his "Systema Piezatorum" and to show, that it was not, *e.g.*, the first species in every genus that was designated, the number of the designated species in the genus is given and following it the actual number of all species in that same genus. (Example: "*Cimbex marginata* 6:12," means that of 12 species belonging to the genus *Cimbex*, he selected the sixth species as genotype).

Cimbex marginata 6:12. *Tarpa cephalotes* 1:2. *Hylotoma enodis* 10:29. *Tenthredo scrophulariae* 1:63. *Lyda pratensis* 10:16. *Oryssus coronatus* 1:1. *Sirex*....0:15. *Xiphydria camelus* 1:3. *Ichneumon*....0:85. *Cryptus serratorius*[2] 18:103. *Bassus seductorius* 4:33. *Bracon denigrator* 33:40. *Pelecinus polycerator* 1:1. *Pimpla vagatoria* 2:33. *Joppa dorsata* 1:9. *Salius bicolor* 1:3. *Banchus venator* 1:15. *Ophion luteus* 1:46. *Foenus jaculator* 1:3. *Cynips*....0:23. *Diplolepis* ....0:24. *Cleptes ignita*[1] 4:10. *Eucharis*....0:5. *Chalcis* ....0:33. *Leucospis*....0:6. *Chrysis*....0:33. *Parnopes carnea* 1:1. *Evania*....0:8. *Trypoxylon figulus*[1] 2:6. *Podium rufipes* 1:2. *Ceropales maculata*[1] 1:9. *Pompilus viaticus* 12:63. *Dryinus*....0:5. *Pelopoeus lunatus*[1] 4:11. *Sphex sabulosa* 1:4. *Pepsis arenaria* 1:47. *Chlorion lobatum* 1:7. *Larra* ....0:14. *Bembex*....0:21. *Liris aurata* 3:13. *Thynnus* ....0:4. *Tiphia*....0:23. *Bethylus villosus* 1:8. *Scolia* ....0:39. *Hellus 6 punctatus* 1:7. *Elis sexcincta* 1:7. *Cephus pygmaeus* 3:6. *Synagris carnuta* 1:1. *Vespa*....0:78. *Polistes lanio*[1] 1:57. *Zethus coeruleopennis* 1:6. *Eumenes petiolata*[1] 1:23. *Masaris*....0:1. *Celonites*....0:1. *Prosopis albipes* 4:14. *Mellinus mystaceus* 1:13. *Philanthus*....0:25. *Crabro* ....0:25. *Pemphredon leucostoma*[1] 1:9. *Oxybelus uniglumis.* 2:7. *Hylaeus florisomnis* 3:8. *Andrena carbonaria* 1:26. *Megilla tricolor* 7:33. *Dasypoda hirtipes* 1:3. *Xylocopa violacea* 3:17. *Bombus terrestris* 4:56. *Centris dimidiata* 1:36. *Euglossa cordata* 3:4. *Anthidium manicatum* 1:11. *Apis mellifica* 1:12. *Anthophora lanata*[1] 1:41. *Eucera*....0:10. *Melecta histrio* 1:7. *Epeolus variegatus* 1:3. *Nomada*....0:19. *Formica herculeana* 1:75. *Lasius niger* 1:10. *Cryptocerus atratus*[1] 1:5. *Atta 6-dens* 2:6. *Myrmecia forficata* 3:11. *Dorylus* ....0:3. *Mutilla*....0:51.

In many cases the above list will cause changes that are

[1] Not originally included. or for other reasons doubtful if valid as genotype.

[2] Compare: Entomol. Tidskr. vol. 58 nos. I-II, p. 65 (1937).

most unwelcome, but any attempt to rule out the designations of Fabricius will only be temporary, as the truth in the end will survive, and it is generally considered that the author himself knows best which species is the most typical of his own genus. It would be most unfair to Fabricius to punish him for not inventing the name at the same time as the idea, since he has marked out his selections so clearly. If, through ignorance of the designations of Fabricus, or for some other reasons, a code or rule has been enforced to accept as valid only such designations as mention the word "type," this is wrong and is a mistake that must be corrected.

Regarding my own special group, the *Tenthredinidae*, the changes will be:

1) In the so-called Erlanger List, *Tenthredo scrophulariae* was type of the genus *Allantus*, but will now become the type of *Tenthredo*. Already in older times, when only the fauna of Europe was considered, difficulties arose to keep these two genera apart, but as our knowledge, especially of the Asiatic fauna, grew, it became necessary to merge the two genera into one. This has also been done in a monograph of the South-Palearctic and Indo-Malayan Sawfly-fauna, of which the present author has just completed the manuscript of the first part. The former genus *Tenthredella* Rhw. (Tenthredo Konow et auct. plur.) can only be retained as a subgenus.

After this suppressed list of 1801, *Allantus* was first used by Panzer in 1805, Heft 87, Nr. 18, as the name for a genus and in that Heft with *A. lateralis* as the only species. More species were included in later Hefts, but at first the genus *Allantus* was monobasic. The use of *Allantus* in connection with *Tenthredo togata* cannot be accepted, as being doubtful from the publisher's point of view and against his opinion and accordingly against article 30, II, a and b in Rules of Zool. Nomenclature (Science vol. 26). *A. lateralis* belongs to the genus *Laurentia* A. Costa, which latter genus becomes a synonym of the older *Allantus* Panz.

2) As *Pseudoclavellaria marginata* L. is the genotype of *Cimbex* Ol., the genus we hitherto have called *Cimbex* will be without a name and I propose therefore to call it *Neocimbex* n. n. with *Tenthredo* (Cimbex) *lutea* L. as genotype.
3) With *Lyda pratensis* as genotype, the genus *Lyda* will be restored and is no longer a synonym of *Pamphilius*.

An Annotated List of the Ants of Arizona. (Hym.: Formicidae).

By A. C. Cole, Jr., Dept. of Entomology, University of Tennessee.

(Continued from page 101)

58. Pogonomyrmex apache Wheeler. North Miller Canyon, Huachuca Mts. (Wheeler).

59. P. barbatus subsp. rugosus Emery. Grand Canyon, Tempe, Florence, Jerome (Wheeler); Cactus Plain (F. H. Snow); Tucson (Wheeler, Cole); Tuba City, Cameron, Douglas, 40 Mi. S. Prescott, 74 Mi. S. Phoenix (Cole).

The nests at all localities visited by the writer were flat craters, 8 to 10 inches in diameter, in coarse sand. Several colonies were aggregated in each area, which was invariably dry desert.

60. P. barbatus subsp. curvispinosus Cole. 36 Mi. S. Prescott (Cole). This is the locality of the type. The ants were in a flat mound of pebbles in the center of the federal highway.

61. P. barbatus var. fuscatus Emery. Oracle, Pinaleno Mts., Tempe, Bowie (Wheeler).

62. P. barbatus var. molefaciens Buckley. Pinaleno Mts., Jerome, Benson, Oracle, Hereford, Palmerlee, Palmacoles (Wheeler); Huachuca Mts. (Wheeler, Biedermann, W. M. Mann); Tempe, Prescott (Cockerell); Kit's Peak (Clark & A. N. S. P.); Phoenix (Wheeler, Cole); Tucson, Douglas (Cole).

63. P. barbatus var. nigrescens Wheeler. Gila Bend Mts., Casa Grande, Bowie, South Catalina Mts. (Wheeler).

64. P. californicus Buckley. Grand Canyon, Yuma, Phoenix, Yucca, Welton, Tempe, Nortons (Wheeler); Wilcox (A. K. Fisher); Kingman, Cameron, Tuba City, Prescott, Tucson, Douglas (Cole).

The nests observed by the writer varied from large crater mounds of pure sand in a stream margin area of Opuntia,

Yucca, Kochia and Ephedra near Tuba City, to flat sandy craters in an arroyo with seedling pines and grasses near Prescott.

65. P. CALIFORNICUS var. ESTEBANIUS Pergande. Tucson, Tempe, Florence, Gila Bend Mts., Yucca, Yuma (Wheeler); Thatcher (R. V. Chamberlin); Phoenix (Wheeler, Cole); 25 Mi. E. Needles, Calif. (Cole).

66. P. CALIFORNICUS var. HINDLEYI Forel. Thatcher (R. V. Chamberlin).

67. P. CALIFORNICUS subsp. BARNSEI M. R. Smith. Maricopa Co. (O. L. Barnes).

68. P. CALIFORNICUS subsp. MARICOPA Wheeler. Pinalino Mts., Phoenix, South Catalina Mts., Benson, Tucson, Yuma, Nortons, Welton, Dragoon Mts. (Wheeler); Sanford, Graham Mts., Ash Creek (E. G. Holt); Huachuca Mts. (W. M. Mann); Coyote Mts. (Clark & A. N. S. P.); Douglas (Cole).

69. P. DESERTORUM Wheeler. Tucson and desert east, Benson, Tempe (Wheeler); Thatcher (R. V. Chamberlin); Bowie (Cornell Univ. Exped.); Kingman (Cole).

70. P. DESERTORUM var. FERRUGINEUS Olsen. Tucson (Pergande, P. Klingenberg).

71. P. HUACHUCANUS Wheeler. Huachuca Mts., South Catalina Mts., Dragoon Mts., Oracle (Wheeler); Seligman (Cole).

72. P. OCCIDENTALIS Cresson. Huachuca Mts., Ash Fork, Pinaleno Mts. (Wheeler); Grand Canyon, Prescott (Cole, Wheeler); Williams, Peach Springs, Seligman, Cameron, The Gap, Marble Canyon, Flagstaff (Cole).

73. P. SIMILIS Olsen. Oracle (Wheeler).

74. P. (EPHEBOMYRMEX) PIMA Wheeler. Tucson, Phoenix, South Catalina Mts., Bowie, Casa Grande, Tempe, Florence (Wheeler).

75. P. (E.) TOWNSENDI Wheeler. Fort Grant, Pinaleno Mts. (Cornell Univ. Exped.); Tucson (Wheeler).

76. MYRMICA MEXICANA Wheeler. Grand Canyon (Wheeler); San Francisco Mts. (W. M. Mann).

77. M. BREVINODIS var. SULCINODOIDES Emery. Prescott (Cole).

78. M. MUTICA Emery. Jacobs Lake (Cole).

79. M. SCABRINODIS Nylander. Grand Canyon (Wheeler).

80. M. SCABRINODIS LOBICORNIS var. GLACIALIS Forel. Grand Canyon (Wheeler); San Francisco Mts. (W. M. Mann).

81. M. SCABRINODIS LOBICORNIS var. FRACTICORNIS Emery.

Flagstaff, Williams (Cole).

82. LEPTOTHORAX NITENS Emery. Grand Canyon (Wheeler).

83. L. NEOMEXICANUS Wheeler. Grand Canyon (Wheeler).

84. L. CURVISPINOSUS RUGATULUS var. COCKERELLI Wheeler. Huachuca Mts. (Biedermann, Mann, Wheeler).

85. XIPHOMYRMEX SPINOSUS subsp. INSONS Wheeler. Huachuca Mts. (Wheeler).

86. X. SPINOSUS subsp. WHEELERI Forel. Huachuca Mts. (Wheeler).

87. X. SPINOSUS subsp. HISPIDUS Wheeler. Tucson, Phoenix (Wheeler).

88. ATTA (TRACHYMYRMEX) ARIZONENSIS Wheeler. Huachuca Mts. (Wheeler); Palmerlee (C. Schaeffer).

89. A. (T.) DESERTORUM Wheeler. Tucson (Wheeler).

90. A. (MOELLERIUS) VERSICOLOR Pergande. Yucca (Wheeler); Tucson (Fenner, Wheeler); 30 Mi. E. Kingman, 36 Mi. S. Prescott, Phoenix (Cole).

Subfamily DOLICHODERINAE Lund.

91. LIOMETOPUM APICULATUM Mayr. Huachuca Mts. (Biedermann); Grand Canyon (Cole).

92. L. APICULATUM subsp. LUCTUOSUM Wheeler. Grand Canyon (Wheeler, Cole); Prescott (Wheeler).

93. DORMYRMEX PYRAMICUS Roger. Grand Canyon (Wheeler, Cole); Jacobs Lake, Prescott, Tucson, Williams, Flagstaff (Cole).

I found numerous colonies of this ant at all the localities cited. Some were beneath rocks, others occupied small mounds of sand or other finely-divided soil particles. At Grand Canyon the small nests were on mound faces of *Pogonomyrmex occidentalis* Cresson, and at Prescott they were scattered between nests of *Myrmecocystus mexicanus horti-deorum* McCook. All were in rather moist habitats.

94. D. PYRAMICUS var. BICOLOR Wheeler. Grand Canyon, 16 Mi. S. Prescott, Douglas, Phoenix, Tucson (Cole).

This pretty variety of *D. pyramicus* inhabits more zeric places than does the typical species. Its small crater mounds are constructed in sand.

95. TAPINOMA SESSILE Say. Grand Canyon (Wheeler, Cole); Huachuca Mts. (Wheeler, Biedermann).

96. IRIDOMYRMEX ANALIS André. Grand Canyon (Wheeler); Marble Canyon, 47 Mi. S. Prescott, Phoenix (Cole). *I. analis* lives in very small crater nests of fine sand.

97. I. PRUINOSUS var. 12 Mi. E. Needles, Calif. (Cole).

98. FORELIUS MACCOOKI Forel. 30 Mi. E. Kingman, Cameron, 36 Mi. S. Prescott (Cole).

This ant appears superficially to be identical with *Iridomyrmex analis* André, and it inhabits similar places. The ant lives in aggregations of minute sandy craters in the drier parts of the desert. The workers are very aggressive.

Subfamily CAMPONOTINAE.

99. PRENOLEPIS IMPARIS Say. Grand Canyon (Wheeler, Cole); Huachuca Mts. (W. M. Mann).

100. P. IMPARIS var. ARIZONICA Wheeler. Huachuca Mts. (W. M. Mann).

101. P. (NYLANDERIA) GUATEMALENSIS Forel. Grand Canyon (Wheeler).

102. LASIUS BREVICORNIS Emery. Prescott, Flagstaff (Cole).

103. L. NIGER var. AMERICANUS Emery. Grand Canyon (Wheeler, Cole); Williams (Cole).

104. L. NIGER var. SITKAËNSIS Pergande. Flagstaff (Cole). This ant was rather common beneath small stones on the grassy forest floor of a yellow pine and Englemann spruce forest.

105. L. NIGER var. NEONIGER Emery. Flagstaff (Cole).

106. L. UMBRATUS subsp. SUBUMBRATUS Viereck. Williams (Wheeler).

107. L. (ACANTHOMYOPS) INTERJECTUS subsp. ARIZONICUS Wheeler. Huachuca Mts. (Wheeler, Biedermann, W. M. Mann).

108. FORMICA SANGUINEA subsp. SUBNUDA Emery. San Francisco Mts. (W. M. Mann).

109. F. SANGUINEA subsp. PUBERULA Emery. Graham Mts. (E. G. Holt).

110. F. RUFA subsp. OBSCURIPES Forel. Thatcher (R. V. Chamberlin); Williams, Flagstaff (Cole).

111. F. PERPILOSA Wheeler. Tucson, Benson (Wheeler, Cole); Tempe (Cockerell); Cameron, Douglas (Cole).

At Cameron I saw many crater nests in very sandy soil. The colonies were populous and contained much brood. The nests were scattered between mounds of *Pogonomyrmex barbatus* subsp. *rugosus* Emery.

112. F. FORELIANA Wheeler. Huachuca Mts. (Biedermann).

113. F. FUSCA L. San Francisco Mts. (W. M. Mann).

114. F. FUSCA var. SUBSERICEA Say. Williams (Cole).

115. F. FUSCA var. SUBAENESCENS Emery. Prescott (Cole). At this place there were many earthen mounds, about 4 inches

in diameter with single central openings, in a forest of young pine.

116. F. FUSCA var. ARGENTEA Wheeler. Grand Canyon, Williams (Wheeler); Graham Mts. (E. G. Holt); San Francisco Mts. (A. K. Fisher); Huachuca Mts. (H. A. Wenzel).

117. F. FUSCA var. NEORUFIBARBIS Emery. Grand Canyon (Wheeler).

118. F. FUSCA var. GELIDA Emery. Grand Canyon (Wheeler).

119. F. NEOGAGATES Emery. Ash Fork (Wheeler); Grand Canyon, Williams (Wheeler, Cole); Flagstaff (F. E. Pratt).

120. F. NEOGAGATES LASIOIDES var. VETULA Wheeler. Prescott (Cole).

121. F. SUBPOLITA Mayr. Grand Canyon (Wheeler, Cole). I was surprised to find but one colony of this species in the Coconino Forest, for the place is decidedly within the ant's normal range and the habitat is a suitable one. An examination of the literature failed to indicate the ant's presence in other Arizona localities.

122. F. RUFIBARBIS var. GNAVA Buckley. Grand Canyon, Phoenix, Prescott, Tempe, Tucson, Benson, Huachuca Mts. (Wheeler); Huachuca Mts. (W. M. Mann).

123. F. COMATA Wheeler. Flagstaff (Cole).

124. F. MOKI Wheeler. Prescott, Grand Canyon (Wheeler).

125. MYRMECOCYSTUS MEXICANUS var. HORTI-DEORUM McCook. Cameron, Prescott, Phoenix (Cole).

Apparently this ant is an occasional invader of the true desert, inasmuch as it was found near Phoenix. Its pebble mounds are usually constructed on rocky ridges at much higher elevations.

126. M. MELLIGER Forel. Grand Canyon (Wheeler).

127. M. MELLIGER var. SEMIRUFUS Emery. Yucca (Wheeler); Phoenix, Tucson (Wheeler, Cole); The Gap, Marble Canyon, Cameron, 57 Mi. N. Cameron, Tuba City (Cole).

This is probably one of the most common desert ants. Its shallow crater nests of sand are almost everywhere in dry areas. Workers are very active.

128. M. MELLIGER SEMIRUFUS var. TESTACEUS Emery. Phoenix (Wheeler, Cole).

129. M. MELLIGER SEMIRUFUS var. ROMAINEI Cole. Cameron (M. Romaine).

130. M. MELLIGER var. JESUITA Wheeler. Cameron (Cole).

131. M. MELLIGER subsp. MIMICUS Wheeler. Jerome, Tempe, Yucca, Ash Fork (Wheeler); Tucson, Phoenix

(Wheeler, Cole); 30 Mi. E. Kingman, 16 Mi. S. Prescott (Cole).

This ant is typically a desert dweller. It constructs shallow crater mounds 8 to 10 inches in diameter. The colonies observed by the writer were large and contained no repletes.

132. M. MELLIGER subsp. MENDAX Wheeler. Grand Canyon (Wheeler).

133. M. MELLIGER subsp. ORBICEPS Wheeler. Ash Fork, Tucson (Wheeler); Cochise Co. (Biedermann).

134. CAMPONOTUS SCHAEFFERI Wheeler. Palmerlee (C. Schaeffer); Huachuca Mts. (Biederman, Oslar).

135. C. ACUTIROSTRIS var. CLARIGASTER Wheeler. Grand Canyon (Wheeler).

136. C. SAYI Emery. Prescott, Phoenix (Wheeler); Graham Mts. (E. G. Holt).

137. C. FALLAX subsp. RASILIS Wheeler. Arizona (Wheeler).

138. C. FALLAX RASILIS var. PAVIDUS Wheeler. Arizona (Wheeler).

139. C. MATULATUS subsp. VICINUS Mayr. Grand Canyon (Wheeler); Flagstaff, Prescott, Williams (Cole).

This form nests beneath logs at higher elevations in the State.

140. C. MACULATUS VICINUS var. LUTEANGULUS Wheeler. Huachuca Mts. (Wheeler).

141. C. MACULATUS VICINUS var. NITIDIVENTRIS Emery. Grand Canyon (Wheeler, Cole); Flagstaff, Prescott (Cole).

This ant is common at higher elevations and almost invariably nests beneath rocks. It is a typical pine forest insect.

142. C. MACULATUS VICINUS var. INFERNALIS Wheeler. Williams (Wheeler).

143. C. MACULATUS subsp. MACCOOKI Forel. Grand Canyon (Wheeler); Prescott (Cole).

144. C. MACULATUS subsp. SANSABEANUS Buckley. Huachuca Mts. (Wheeler).

145. C. MACULATUS SANSABEANUS var. TORREFACTUS Wheeler. Grand Canyon (Wheeler).

146. C. MACULATUS subsp. BULIMOSUS Wheeler. Huachuca Mts. (Wheeler, Mann, Biedermann).

147. C. FUMIDUS var. FESTINATUS Buckley. Arizona (Wheeler).

148. C. FUMIDUS var. SPURCUS Wheeler. Huachuca Mts. (Wheeler).

149. C. VAFER Wheeler. Huachuca Mts. (Wheeler).

150. C. ACUTIROSTRIS var. CLARIGASTER Wheeler. Grand

Canyon (Wheeler).

151. C. OCREATUS subsp. PRIMPILARIS Wheeler. Huachuca Mts., Nogales (Wheeler, Mann, Biedermann).

152. C. MINA subsp. ZUNI Wheeler. Tucson (Wheeler).

153. C. (COLOBOPSIS) ULCEROSUS Wheeler. Huachuca Mts. (Wheeler).

Marked Migrant Butterflies (Lepid.: Nymphalidae).

Under this title, in the *Entomologist's Record and Journal of Variation* (London), for October, 1936, Mr. T. Bainbrigge Fletcher, formerly Imperial Entomologist for India, comments on the absence of information on the actual movements of individuals and continues: "To attain this necessitates the marking of individual butterflies in such a way that each individual may be recognizable at any time or place. . . . After trials of several methods, . . . I have marked individuals with numbers on small labels applied directly to the wing. The process is quite simple. After netting, the specimen is examined for sex and any individual peculiarities (condition, chips, splits or tears of the wings, markings, etc.), which are noted in a register; a small patch on the upper surface of the right fore wing is then rubbed clear of scales and a small label is attached to this bare patch with Canada balsam; the butterfly is then placed in a glass-bottomed box for a few minutes, to allow the adhesive to harden, and it is then released. The label, which does not incommode its flight in the least, is written in waterproof Indian ink on tracing paper, a small sheet of labels being written up and each one cut off as required. . . . Any combination of letters or of numbers can be used, provided that each marker has his distinct series. It is desirable to descale the portion of the wing to which the label is to be applied, as in some of my earlier experiments, in which I did not descale, I found that the labels sometimes became detached by being pulled off with the patch of the underlying scales; since practising descaling I find that the label is very rarely lost. . . . During this season I have marked up to date (27. ix. 36) 67 *V. atalanta*, 7 *V. cardui* and 1 *V. io*. Of the *V. cardui* one individual remained here and was seen frequently for ten days after release. Of the *V. atalanta* six remained for two or three days, . . . one for seven days and one for twelve days; so that only three individuals out of seventy-five remained for any appreciable period, all the rest flying off again at once or almost at once."

On Certain Words Used in Connection with the Coccoidea (Homoptera).

By G. F. Ferris, Stanford University, California.

The fact that an officially encouraged glossary of entomological terms is in course of preparation makes it opportune to call attention to certain errors of terminology which are at present current in the literature of the scale insects.

One of these errors has to do with the word "puparium." In its most generally accepted usage this word is applied to the sclerotized larval skin within which pupation takes place in certain of the Diptera and thus has a very precise meaning. But it has been employed by writers dealing with the scale insects in two meanings, neither of which has exactly this application. It has been used for the scale of the Diaspididae, both male and female, which is formed from shed skins and secretion, although there is no pupa involved in the case of the female at all. In the male there is a stage which may be regarded as a pupa, but this is not enclosed within a shed skin. The word has also been used in connection with a phenomenon, of rather common occurrence in the Coccoidea, which has more similarity to that which occurs in the Diptera.

In many species of Coccoidea, of various families, the adult female and even as many as two preceding larval stages, remains within a heavily sclerotized larval skin which serves as a protection as does the enclosing larval skin of a dipterous puparium. To this sclerotized larval skin the term "puparium" has been applied, even though it has been recognized that the application is not entirely proper, since there is no pupa involved. A recent author dealing with a group of species, almost all of which are "puparial," has called attention to this inexactness, but has employed the word in the absence of any other.

It is here suggested that in these cases the term "pupillarium," with the adjective "pupillarial," might suitably be used. The term is apt, since one of the meanings of the word "pupilla" is a "ward," and in the scale insects in which this phenomenon occurs the adult female, or other enclosed stage, is

peculiarly the ward of the earlier larval form. Furthermore, the fundamental resemblance of this phenomenon to that which occurs in the Diptera is not obscured by the use of this term.

The term "pupillarium" may therefore be defined as "a sclerotized larval skin within which later stages may remain enclosed in forms, such as Coccoidea, in which no pupal stage exists."

Another word which needs definite stabilization is the one which refers to a shed skin. The Latin word "exuviae," a feminine noun, was employed only in the plural form, very much like our word "clothes," to designate cast-off garments or a skin. In the case of insects, such as the Diaspididae, where two shed skins enter into the composition of the scale, we really need a singular form to indicate a single skin in contradistinction to the totality of skins. There has been much looseness of usage—in which the present writer has participated. Smith's glossary lists "exuvia-iae-ium: the cast skin of a larval insect." and apparently all these forms have been used rather indiscriminately to apply either to a single cast skin or to more than one.

MacGillivray called attention to this situation and employed the singular, "exuvia." Since this appears to be the form which the Romans would have used if they had employed the singular, and such a form is much needed, it would seem to be reasonable to adopt it. Attention is called to the matter here since MacGillivray's note is buried in the midst of a mass of terminology much of which is not so clearly supportable, and it might easily be overlooked.

Another word for which present definitions are somewhat unsatisfactory is "pygidium." The word is employed on the one hand to indicate "the last dorsal segment left exposed by the elytra," which is morphologically a most inexact expression, since this segment is not necessarily always numerically the same, and on the other hand to designate "in Diaspinae, the compound terminal segment," which again is morphologically meaningless. The word, however, has become so firmly established in the literature of the scale insects that it would be very difficult to secure the acceptance of any other at this late date.

It may, nevertheless, be defined with somewhat more precision.

With due regard to what appears to be the actual morphological situation it may be redefined in its application to the scale insects as follows: "in the Diaspididae, the terminal and dorsally more or less scleriotic portion of the abdomen formed by the modification and partial fusion of the fifth to eleventh segments." Its more exact definition as applied to other groups is no present concern of the writer.

OBITUARY

[The following was received by a correspondent of Prof. Wheeler.]

HARVARD UNIVERSITY

Cambridge, April 21, 1937.

SIR:

With great regret I inform you of the death of

WILLIAM MORTON WHEELER

Professor of Entomology, *Emeritus*, and Associate Curator of Insects in the Museum of Comparative Zoölogy, which occurred on the nineteenth instant, in the seventy-third year of his age.

Funeral services will be held in The Memorial Church on Thursday, April 22, at 2 P. M.

Your obedient servant,

JAMES BRYANT CONANT.

Entomological Literature

COMPILED BY V. S. L. PATE, LAURA S. MACKEY and E. T. CRESSON, Jr.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of ENTOMOLOGICAL NEWS **for 10c. The number of, or annual volume, and in some cases the part, heft, &c. the latter within ( ) follows; then the pagination follows the colon :**

All continued papers, with few exceptions, are recorded only at their first installments.

(*) Papers containing new forms or names not so stated in titles, have an * within parentheses thus (*) following the pagination of reference to paper.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. Titles of papers containing new forms or new names will be indicated by an asterisk within parentheses at end of reference, (*).

Papers published in the Entomological News are not listed.

GENERAL.—Buckell, E. R.—Notes on ticks and insect parasites of game animals in British Columbia. [Proc. Ent. Soc. Brit. Col.] no. 31: 10-16. **Craighead et al.**—The relation of insects to slash disposal. [U. S. D. A., Dept. Circ.] no. 411. 12 pp. **Felt, E. P.**—Balloons as indicators of insect drift and of Dutch elm disease spread. [Bartlett Tree Res. Labs., Sci. Contrib., Bull.] no. 2: 3-10, ill. **Hopping, G. R.**—Entomological illustrating. [Proc. Ent. Soc. Brit. Col.] no. 32: 20-22. **Jacot, A. P.**—Principles of scientific publication. [6] 45: 127-129. **Jaeger, J. M.**—More than mere insects. [Nature Mag.] 28: 205-207, ill. **Needham, Galtsoff, Lutz, Welch, et al.**—Culture Methods for Invertebrate animals. Ithaca, Comstock pub. Co., 1937. 590 pp., ill.

ANATOMY, PHYSIOLOGY, ETC.—Beadle, Clancy & Ephrussi.—Development of eye colours in Drosophila: pupal transplants and the influence of body fluid on vermilion. [Proc. Roy. Soc., London] B, 122: 98-105. **Carter, W.**—Aphis transmittal of Commelina nudiflora mosaic to pineapple. [7] 30: 155-161, ill. **Eckert, J. E.**—Honeybee monstrosities. [7] 30: 64-69, ill. **Fife, L. C.**—Number of instars of the pink boll-worm collected in squares and in bolls of cotton. [7] 30: 57-63. **Fox, H.**—Seasonal trends in the relative abundance of Japanese beetle populations in the soil during the annual life cycle. [6] 45: 115-126. **Her-**

ing, M.—Analogie, Homologie und Funktions-wechsel der Basaldornes am Lepidopteren-Vorderflugel. [Parnassiana] 4: 17-20, ill. Die Genital-Morphologie von Parnassius autocrator. [Parnassiana] 4: 38-42, ill. **Heriot, A. D.**—Notes on the moulting of mites and insects. [Proc. Ent. Soc. Brit. Col.] no. 32: 8-10. The crumena of the Coccidae and the Adelges. [Proc. Ent. Soc. Brit. Col.] no. 33: 22-24. **Hilton, W. A.**—Nervous system. LXI. Insects, Orthoptera. [13] 29: 18-23, ill. **Kirkpatrick, T. W.**—Colour vision in the triungulin larva of a Strepsipteron (Corioxenos antestiae). [107] A, 12: 40-44, ill. **Klingstedt, H.**—Chromosome behaviour and phylogeny in the Neuroptera. [31] 139: 468-469. **Kozhantchikov, I.**—In the periodicity of mass production of insect pests. The influence of temperature and humidity on the pupal development of Agrotis segetum and on the quantity of the next generation. [Bull. Plant Prot., Leningrad] no. 19, 36 pp., ill. **Maple, J. D.**—The biology of Ooencyrtus johnsoni, and the role of the egg shell in the respiration of certain Encyrtid larvae (Hymen.). [7] 30: 123-154, ill. **Prochazka, R.**—Etude sur l'importance morphomatique et systematique des ailes des Malacodermata (Coleoptera). [74] 14: 100-132, ill. **Pumphrey & Rawdon-Smith.**—Synaptic transmission of nervous impulses through the last abdominal ganglion of the cockroach. [Pro. Roy. Soc., London] B, 122: 106-118, ill. **Rehberger, K.**—Studies on the mouth organs of Malacodermata (Coleoptera). [74] 14: 44-57, ill. **Richards & Miller.**—Insect development analyzed by experimental methods: a review. Pt. 1. Embryonic stages. [6] 45: 1-60, ill. **Salt, G.**—The sense used by Trichogramma to distinguish between parasitized and unparasitized hosts. [Proc. Roy. Soc., London] B, 122: 57-75. **Sargent, W. D.**—The internal thoracic skeleton of the dragonflies (Odonata, Anisoptera). [7] 30: 81-95, ill. **Speyer, W.**—Die Entwicklung von Psylla mali. [110] 3: 267-283. **Tauber, O. E.**—The effect of ecdysis on the number of mitotically dividing cells in the hemolymph of the insect Blatta orientalis. [7] 30: 35-39.

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FOREST INSECTS. A Textbook for the Use of Students in Forest Schools, Colleges, and Universities, and for Forest Workers. By R. W. DOANE, E. C. VAN DYKE, W. J. CHAMBERLIN and H. E. BURKE. 1st ed. Pp. xii + 463, figs. 234. McGraw Hill Book Co., New York and London. $4.50. This volume brings together in a convenient form a great deal of practical information on the life histories of forest insects and the methods in use for their control. Short introductory chapters deal with the importance of forest insects, the general principles governing their control and the special methods in use against bark beetles. Then follow chapters dealing with individual taxonomic groups, giving detailed accounts of many important economic species together with briefer references to related forms. Almost 200 pages are devoted to beetles, 80 pages to lepidopterous insects; and there are shorter chapters of 20 to 30 pages each on hemipterous, dipterous and isopterous pests. Each of the twelve chapters is provided with several pages of a classified bibliography. Added together this bibliography comprises a total of about 26 pages. An appendix lists the coniferous trees with their pests and there is an excellent index of 29 pages.—R. G. SCHMIEDER.

CULTURE METHODS FOR INVERTEBRATE ANIMALS. A Compendium prepared cooperatively by American zoologists under the direction of a committee from Section F of the American Association for the Advancement of Science. By PAUL S. GALTSOFF, FRANK E. LUTZ, PAUL S. WELCH and JAMES G. NEEDHAM (Chairman); assisted by many specialists whose names appear in connection with their respective contributions to this volume. Pp. xxxii + 590, 84 figs. Comstock Publishing Co., Inc., Ithaca, New York, 1937. Price $4.00 — This volume contains 316 separate articles, contributed by 186 individual zoologists. One general article, of 36 pages, deals with marine aquaria; another, of 10 pages, with fresh water aquaria and the collection of aquatic and terrestrial forms. Craneflies, mosquitoes, surgical maggots and Drosophila each occupy from 7 to 9 pages, while all the remaining articles are quite brief. In every case the method described is that found most useful by the contributor, who is frequently an outstanding authority on the form in question. Almost half the book, 260 pages, containing 161 articles, is devoted to insects. Methods for culturing and obtaining a continuous supply of many species are given, methods that have been developed for use in the study of economic entomology both medical and agricultural, for use in genetic research and for investigations of life histories and biology. A perusal of the contents of this book will no doubt often suggest some available form useful in research problems requiring a continuous supply of living material.—R. G. SCHMIEDER.

ATLAS OF THE SCALE INSECTS OF NORTH AMERICA. By G. F. FERRIS. Stanford University Press, Stanford University California. London: Humphrey Milford, Oxford University Press. 28 x 21.5 cm. Serial No. 1, Introduction, January, 1937, and some other numbers are before us, accompanied by an explanatory leaflet on green paper. From the Introduction we learn that "This work represents an attempt to make possible the definite identification of every species of scale insect now known from North America, or which may become known during the course of its preparation. . . . The word 'Atlas' has been used in the title to convey an implication that this work will be essentially a collection of plates of illustrations with textual material reduced to the barest minimum that will suffice for necessary explanation." It is thought that the number of species to be treated will be as many as 750 and the time to be occupied in publication something less than ten years. Each species will be dealt with in a separate serial number, without pagination, in loose-leaf form, each number comprising a plate of pen and ink drawings reproduced by photolith, as is also the accompanying text. Single numbers, in any combination or quantity, may be obtained from the Stanford University Press. The plates are standardized as to contents and lettering and illustrate chiefly the adult female, but often details of the first and second stages also. A provisional classification is set forth in the Introduction. The "family Coccidae must be stepped up at least to a superfamily, Coccoidea*, in order to provide a better graded series of categories for the thousands of species still to be discovered." Within the Coccoidea eleven families are recognized. "In his use of generic names the author will endeavor to be reasonable, recognizing the interest of the non-systematist in nomenclatorial stability, but none the less refusing to yield in what he feels to be scientific honesty merely to please others." The question is considered to some further extent in an interesting manner. That Prof. Ferris's Atlas will be highly useful we can not doubt, and we hope that he will be able to carry it on to its projected end. At the same time Prof. Ferris is also issuing Contributions to the Knowledge of the Coccoidea in the lately established journal "MICROENTOMOLOGY, Contributions to Entomology from the Natural History Museum of Stanford University," as in Vol. II, pt. 1, March 24, 1937, similar in style and illustrations to the 'Atlas'.—P. P. CALVERT.

* Tillyard, Insects of Australia and New Zealand, 1926, p. 170. and possibly others have done this, while Dr. Pierce has the *order* Coccoptera, ENT. NEWS, 47: 257-263, Dec., 1936.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

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